AF/1764

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Giuseppe GUARINO, et al.

Appln. No.: 09/231,791

Confirmation No.: 2603

Filed: January 15, 1999

Attorney Docket No: Q52856

Group Art Unit: 1764

Examiner: Frederick T. Varcoe Jr.

For: METHOD FOR IN-SITU MODERNIZATION OF A HETEROGENEOUS SYNTHESIS REACTOR

SUBMISSION OF APPELLANT'S BRIEF ON APPEAL

Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith please find an original and two copies of Appellant's Brief on Appeal. A check for the statutory small entity fee of $160.00 is attached. The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account. A duplicate copy of this paper is attached.

Respectfully submitted,

Neil B. Siegel
Registration No. 25,200
for
Robert V. Sloan
Registration No. 22,775

Date: January 21, 2003

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

23373

PATENT TRADEMARK OFFICE

 PATENT APPLICATION

#21

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Giuseppe GUARINO, et al.

Attorney Docket No: Q52856

Appln. No.: 09/231,791

Group Art Unit: 1764

Confirmation No.: 2603

Examiner: Frederick T. Varcoe Jr.

Filed: January 15, 1999

For: METHOD FOR IN-SITU MODERNIZATION OF A HETEROGENEOUS SYNTHESIS REACTOR

APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Commissioner for Patents
Washington, D.C. 20231

Sir:

In accordance with the provisions of 37 C.F.R. § 1.192, Appellant submits the following:

I. REAL PARTY IN INTEREST

The real party and interest is Ammonia Casale S.A., the Assignee of the above identified application in an Assignment recorded in the U.S. Patent and Trademark Office on January 15, 1999 at Reel 9723, Frame 0942.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1-10 inclusive are currently pending in the present application. Claims 1-10 inclusive stand rejected and are presently the claims on Appeal.

IV. STATUS OF AMENDMENTS

In the Final Rejection claims 1-10 inclusive were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Claims 1, 4-6, 9 and 10 were rejected under 35 U.S.C. § 102(b) as being anticipated by Poussin, USP 5,202,097. Claims 2, 3, 7 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Poussin USP 5,202,097. In the amendment after Final claims 1 and 6 were amended solely for the purpose of overcoming the rejection under 35 U.S.C. § 112. In the Advisory Action of October 7, 2002 it was stated that applicants reply overcame the rejection under 35 U.S.C. § 112, second paragraph. The Advisory Action further stated that for purposes of Appeal the proposed amendment will be entered and an explanation of how the claims would be rejected was provided.

V. SUMMARY OF THE INVENTION

The present invention is directed to a method for in-situ modernization of a heterogeneous synthesis reactor. The present invention is also directed to a heterogeneous synthesis reactor. More specifically the term "in-situ modernization" is understood to mean the on-site modification of a pre-existing reactor in order to improve its performances and obtain e.g. a production capacity and/or a conversion yield comparable to those of a newly-built reactor.

The heterogeneous synthesis reactor is disclosed in the sole drawing and is of the type especially suitable for carrying out exothermic heterogeneous synthesis reactions at high pressure and temperatures (20-300 bar, 180-550°C), for instance, for the production of Ammonia or Methanol or for the conversion of carbon monoxide into carbon dioxide.

The reactor is comprised of a tubular envelope or shell 2 provided at the top with a nozzle 3 for the inlet of the reaction gases and at the bottom with a nozzle 4 for the outlet of the reaction

products. The shell 2 is also provided at the top with a nozzle or manhole 5 to allow the passage into the interior of the reactor for carrying out assembly and maintenance operations. In the inside of the shell 2 a catalytic bed 6 of the axial-radial type is provided defined by a gas inlet cylindrical perforated wall 7 and a gas outlet cylindrical perforated wall 8 which are concentrically arranged relative to each other.

As shown in the drawing the gas inlet wall 7 is located near the shell 2 while the gas outlet wall 8 is located in the middle of the reactor 1. Between the shell 2 and the gas inlet wall 7 a free space 9 is provided to allow a radial crossing of the bed 6 by the reaction gases. The gas outlet wall 8 is also closed at the top by a gas tight lid 10. A chamber 11 extends co-axially within the catalytic bed 6 between the wall 8 and the lid 10 for routing the reaction products leaving the bed to a nozzle 4 in the inside of the shell 2 to which the gases are finally evacuated.

The foregoing description of the structure is found on page 7 of the application. The broken line 12 shown in proximity to the upper end of the gas inlet wall 7 delimits the highest level that can be reached by the catalyst within the catalytic bed 6. Before being modernized according to the present invention the reactor 1 still had a catalytic bed 6 whose volume was entirely taken up by a conventional catalyst. According to the present invention the broken line 13 indicates the level reached by the catalyst in the modernized reactor 1. The catalyst inside the bed 6 is indicated by the numeral 14 and has a reaction activity to provide a production capacity of the reactor equivalent to the design capacity but taking up a volume substantially smaller than the volume of the catalytic bed 6. Due to the greater reaction activity, the mass of catalyst 14 loaded in the reactor once the reactor is modernized is much smaller than the catalyst mass

employed before the modernization while still achieving the same production capacity. The arrows F indicate the various routes followed by the gas through the catalytic bed. According to the first step of the modernization method of the present invention there is provided a substantially cylindrical unperforated wall 15 disposed co-axially relative to the gas outlet wall 8 in the catalytic bed 6. The unperforated wall 15 protrudes downwardly from an upper end 8a of the gas outlet wall for a predetermined distance so as to define an annular free-space 16 between the gas outlet wall 8 and the unperforated wall 15 for the passage of a portion of the gas leaving the catalytic bed 6 as indicated by the arrows F.

A further step of the present invention involves the provision of means for closing the free space 16 between the unperforated wall 15 and the gas outlet wall 8 in proximity to the upper end 8a of the latter. This prevents the bypass of the catalytic bed for the recycling of gases entering or leaving the reactor. By providing the unperforated wall near the upper end of the gas outlet wall and defining a free space 16 between the walls for the passage of reacted gases it is possible to load the catalytic bed with amounts of catalyst substantially lower than the previous design amounts without affecting the running of the same adversely. Even though the level of the catalyst 14 remains well beneath the upper end 8a of the gas outlet wall 8 thereby leaving several holes of the wall 8 uncovered the unperforated wall 15 prevents gas reagents from crossing the catalytic bed 6 without penetrating into the catalytic mass and the free-space 16 allows the utilization of all the holes of the walls as outlets for the reaction products.

Should the unperforated wall 15 be in touch directly with the gas outlet wall 8 without the formation of the free-space 16 a catalytic bed would be obtained having the same fluid dynamic

characteristics as the non-modernized bed but due to the reduction in the number of holes available for the outlet of the reaction products the pressure drop would be increased.

The foregoing modernization steps have been presented on pages 8 and 9.

According to a preferred embodiment of the invention the unperforated wall 15 whose diameter is greater than the gas outlet 8 is advantageously supported by a horizontal gas-type baffle 17 which protrudes above the upper end 8a of the gas outlet wall and rests on the upper end of the gas outlet wall. The wall 15 and the baffle form a gas tight assembly which rests upside down on the lid of the gas outlet wall 8. In the operation of the reactor which is set forth on pages 11 and 12 gas reagents supplied into the reactor 1 through the nozzle 3 are fed to the catalytic bed 6 which is comprised of a high activity catalytic 14. Depending on the type of reaction, the temperature and pressure of the gas reactants fed to the catalytic bed 6 are regulated downstream of the reactor 1. The gas reagents flow across the catalytic bed 6 with an axial-radial centripetal flow. Thanks to the presence of the unperforated wall 15 it is possible to deviate the flow of gas reagents axially thereby preventing undesired bypassing of the catalytic bed 6. The reaction products obtained in the catalytic bed 6 cross the gas outlet 8 and are afterwards collected in the chamber 11 before leaving the reactor through the nozzle 4. A small part of the reaction products flow along the free-space 16 which allows usage of the part of the wall 8 surrounded by the wall 15 for the outlet of gases.

In so doing it is possible to load only partly the catalytic bed 6 with a high reaction activity catalyst while still achieving production capacity of the preexisting reactor, and

obtaining savings in the cost of the catalyst. At the same time the fluid dynamics and the pressure drop characteristics of the catalytic bed remain unchanged.

VI. ISSUES

The first issue is whether claims 1, 4-6, 9 and 10 are unpatentable under 35 U.S.C. § 102(b) as being anticipated by Poussin USP 5,202,097. The second issue on Appeal is whether claims 2, 3, 7 and 8 are unpatentable under 35 U.S.C. § 103(a) as being obvious in view of Poussin USP 5,202,097.

VII. GROUPING OF CLAIMS

Claims 1-5 inclusive stand together. Claims 6-10 also stand together. However claims 6-10 inclusive do not stand and all together with claims 1-5 inclusive.

VIII. ARGUMENTS

In the Final Rejection claims 1, 4-6, 9 and 10 were rejected under 35 U.S.C. § 102(b) as being anticipated by Poussin USP 5,202,097.

Claims 1 and 6 both specifically call for an unperforated cylindrical wall 15 coaxial to said gas outlet wall 8 in said catalytic bed. These claims further call for said unperforated cylindrical wall extending from an upper end of said gas outlet wall along a perforated portion of said gas outlet wall for a predetermined length in said catalytic bed. Additionally these claims specifically set forth that a free space 16 is defined between the perforated gas outlet wall 8 and the unperforated wall 15 for the passage of a part of the gas leaving said catalytic bed through said portion of the gas outlet wall facing the free space 16. These limitations are not shown or even suggested by the Poussin patent. It is clearly shown in figure 1 of Poussin that the unperforated cylindrical wall 10 clearly does not extend along a perforated portion of the gas

perf. not shown near cap

outlet wall 9. The perforations appear to be shown schematically in the gas outlet wall 9 as only being located within the catalytic bed 31. The upper and lower ends of the gas outlet wall 9 are not provided with perforations since the upper and lower ends of the gas outlet tube are not surrounded or in contact with the catalytic bed. Thus the cylindrical wall portion of the cap 10 clearly does not extend along a perforated portion of the gas outlet wall for a predetermined length in said catalytic bed. The cylindrical wall of the cap 10 terminates at the top of the catalytic bed and never extends into the catalytic bed. Since figure 1 is a schematic view the only reason for showing the cylindrical wall portion of the cap 10 as being spaced from the gas outlet tube 9 is simply to show that two separate elements are provided. If the cylindrical wall of the cap 10 was touching the upper end of the gas outlet wall there would be no distinguishing of the cap from the upper end of the gas outlet tube. Therefore the spacing in all probability does not exist in an actual reactor. In any event even if there is a spacing it is not provided for the passage of a part of the gas leaving the catalytic bed as called for in claims 1 and 6 since there is no gas exiting at the top end of the gas outlet tube since there are no perforations in the upper end of the gas outlet tube. Thus it is clear that the Examiner is reading structure and function into the Poussin reference which is not there and at the most is only suggested by the present invention. Poussin clearly fails to disclose the specific combination of elements discussed above and accordingly the claims are clearly not anticipated by the teachings of Poussin. Furthermore there is absolutely nothing within the disclosure of Poussin which would suggest modifications to one skilled in the art which would meet the limitations of independent claims 1 and 6.

In the Advisory Action the Examiner specifically disagreed with the foregoing opinion and maintained that the reference of Poussin states that the unperforated cylindrical wall is immersed in the catalyst bed. This is clearly not the case as evidenced by the passage of the specification of Poussin beginning on line 46 of column 7. The specification states that the upper reactor end 4 has above the catalyst bed on which it bears a layer of material 19 which is the layer of material connected to and extending radially outwardly from the lower edge of the cap 10. Thus the layer of fabric material 19 rests on the bed of catalyst material and separates the bed of catalyst material from the ceramic balls above the layer of material 19. Since the layer of material 19 is connected to the lower end of the cap 10 it is absolutely clear that he cylindrical wall of the cap does not extend into the bed of catalyst material. The layer of material 19 diverts the gaseous flow from the inlet 3 outwardly into the space between the annular ring and the outer side wall of the reactor. Thus no gaseous flow enters the catalyst bed in a downward axial direction but all of the gaseous is diverted so that it flows from the space through the perforated wall 7 to the perforated central stack 9. Thus there is absolutely no need to have perforations in the axial stack 9 which extend up into the upper end which is surrounded by the cap 10.

In the present invention some of the gaseous flow comes downwardly through the catalyst bed and therefore the unperforated wall secured to the cap 10 must extend into the catalyst 10 to ensure that the flow goes through sufficient catalyst material prior to passing into the perforated cylindrical central section. Since there is absolutely no need for the perforations to extend all the way to the upper end of the cylindrical stack 9 of Poussin it is submitted that there are no perforations in the upper end portion surrounded by the cylindrical wall of the cap

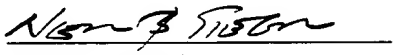
and accordingly the unpeforated cylindrical wall of the cap 10 does not extend along a peforated portion of the gas outlet wall for a predetermined length in said catalytic bed as specifically called for in claims 1 and 6 of the present application. Therefore the Examiner's arguments are totally unsupported by the actual disclosure of Poussin and claims 1 and 6 are clearly not anticipated by Poussin. As stated above there is absolutely nothing within the disclosure of Poussin which would suggest modifications to one skilled in the art which would meet the limitations of independent claims 1 and 6.

In view of the foregoing arguments it is clear that independent claims 1 and 6 are not anticipated by the teachings of Poussin. Furthermore there is absolutely nothing within the disclosure of Poussin which would suggest modifications to one skilled in the art which would meet the limitations of claims 1 and 6 as well as dependent claims 2-5 and 7-10. Therefore it is respectfully requested that he final rejection of claims 1-10 in view of Poussin be reversed.

The present Brief on Appeal is being filed in triplicate. Unless a check is submitted herewith for the fee required under 37 C.F.R. §1.192(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



Neil B. Siegel
Registration No. 25,200
for
Robert V. Sloan
Registration No. 22,775

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

23373
PATENT TRADEMARK OFFICE

Date: January 21, 2003

APPENDIX

CLAIMS 1-10 ON APPEAL:

1. A method for in-situ modernization of a heterogeneous synthesis reactor, including an external shell comprising at least a catalytic bed (6) provided with a gas inlet perforated cylindrical wall (7) and a gas outlet perforated cylindrical wall (8), said method comprising the steps of:

providing an unperforated cylindrical wall (15) coaxial to said gas outlet wall (8) in said catalytic bed (6), said unperforated cylindrical wall (15) extending from an upper end (8a) of said gas outlet wall (8) along a perforated portion of said gas outlet wall and for a predetermined length in said catalytic bed, so as to define a free-space (16) between the perforated gas outlet wall (8) and the unperforated wall (15), for the passage of a part of the gas leaving said catalytic bed (6) through said portion of the gas outlet wall (8) facing said free-space (16);

providing means for closing an upper end of said free-space (16) between the unperforated wall (15) and the gas outlet wall (8), in proximity of the upper end (8a) of the wall (8), preventing thereby a bypass of said catalytic bed or a recycling to the catalytic bed of the gas entering and leaving the reactor, respectively.

2. The method according to claim 1, characterised in that said unperforated wall extends for a portion corresponding to 5%-50% of the length of said gas outlet wall (8).

3. The method according to claim 1, characterised in that said free-space (16) has a thickness between 0.5 and 10 cm.

4. The method according to claim 1, characterised in that said unperforated wall (15) is supported by said gas outlet wall (8).

5. The method according to claim 4, wherein said gas outlet wall (8) has a diameter smaller than the diameter of said gas inlet wall (7) and of said unperforated wall (15), characterised in that said unperforated wall (15) is supported by a gas-tight horizontal baffle (17) which protrudes above the upper end (8a) of said gas outlet wall (8), and rests on the same.

6. A heterogeneous synthesis reactor comprising:

an external shell (2);

at least a radial or axial-radial catalytic bed (6), provided with a gas inlet perforated cylindrical wall (7) and a gas outlet perforated cylindrical wall (8), extended in said shell (2);

characterized in that it further comprises in said catalytic bed:

an unperforated cylindrical wall (15) coaxial to said gas outlet wall (8) in said catalytic bed (6), said unperforated cylindrical wall (15) extending from an upper end (8a) of said gas outlet wall (8) along a perforated portion of said gas outlet wall and for a predetermined length in said catalytic bed (6), so as to define a free-space (16) between the perforated gas outlet wall (8) and the unperforated wall (15), for the passage of a part of the gas leaving said catalytic bed (6) through said portion of the gas outlet wall (8) facing said free-space (16);

means for closing said free-space (16) between the unperforated wall (15) and the gas outlet wall (8), in proximity of the upper end (8a) of the latter, preventing thereby a bypass of

said catalytic bed or a recycling to the catalytic bed of the gas entering and leaving the reactor respectively.

7. The reactor according to claim 6, characterised in that said unperforated wall (15) extends for a length corresponding to 5%-50% of the length of said gas outlet wall (8).

8. The reactor according to claim 6, characterised in that said free-space (16) is substantially annular and has a thickness between 0.5 and 10 cm.

9. The reactor according to claim 6, characterised in that said unperforated wall (15) is supported by said gas outlet wall (8).

10. The reactor according to claim 9, wherein said gas outlet wall (8) has a diameter smaller than the diameter of said gas inlet wall (7) and of said unperforated wall (15), characterised in that said unperforated wall (15) is supported by a gas-tight horizontal baffle (17) which protrudes above the upper end (8a) of said gas outlet wall (8), and rests on the same.